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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD
UNIVERSITY, NEW SERIES, No. XIV.

By J. M. GREENMAN.

Presented by B. L. Robinson, April 13, 1898.

I. — REVISION OF THE MEXICAN AND CENTRAL AMERICAN SPECIES OF GALIUM AND RELBUNIUM.

A PRELIMINARY study of the Mexican and Central American species of *Galium* has made it necessary to take into consideration the North American representatives of the nearly allied genus *Relbunium*. The latter, although not so numerous in Mexico, increases southward and attains its maximum in South America, where it to a considerable extent replaces the genus *Galium*.

Relbunium was first so designated by Endlicher,¹ as a section under *Galium*. Subsequently it was taken up by Bentham and Hooker,² and established as a genus; a similar view being held by Schumann³ and by Hemsley,⁴ while Dr. Gray in the Synoptical Flora placed the North American representatives of *Relbunium* under *Galium*.

The typical *Relbunium*, however, is so well marked by its involucrate flowers and distinctly axillary inflorescence, that it has seemed best to the writer in the following synoptic revision to follow essentially the generic limitations laid down by Bentham and Hooker, and by Schumann in Engler and Prantl's Nat. Pflanzenfamilien.

It may be added that in the examination of a large number of specimens no difficulty whatever was experienced in placing a given specimen definitely either in one genus or in the other, except in the case of *G. angulosum*. This species is somewhat intermediate between the two genera, but a close examination of the inflorescence seems to indicate its affinity with *Galium* rather than with *Relbunium*.

¹ Gen. Pl. 523.

² Gen. ii. 149.

³ Fl. Bras. vi. pt. 6, 103; Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 4, 154.

⁴ Biol. Cent.-Am. Bot. ii. 62.

It will be noticed that a few species are herein treated which have not as yet been reported from Mexico or Central America. In these cases the known locality is such that the occurrence of the species may be expected in Northern Mexico. Besides the material in the Gray Herbarium, the writer, through the kindness of Dr. J. N. Rose, has been permitted to borrow from the U. S. National Museum for examination the Mexican and Central American specimens of these two genera.

GALIUM, Linn. (Name from ancient Greek γάλιον, supposed to be *Galium verum*, and derived by Dioscorides from γάλα, milk, which it was used to curdle.) Flowers perfect, polygamo-diœcious, or unisexual, exinvolucrate. Calyx-tube ovoid or globose; limb obsolete. Corolla rotate, usually 4-lobed (not unfrequently 3-lobed, and rarely 5-lobed); lobes valvate. Stamens of the same number and alternating with the lobes of the corolla, adnate to the base of the tube: anthers on short filaments, exserted. Disk annular. Ovary 2-celled; styles more or less 2-cleft; stigmas capitate; ovules solitary in the cells, borne on the dissepiment, amphitropous. Fruit didymous, dry, subcarneous, or distinctly baccate, smooth, tuberculate, or hispid, separating into closed carpels, or only one carpel maturing. Seeds concave on the face; embryo curved; cotyledons foliaceous; radicle inferior. — Annuals, herbaceous perennials, or rarely suffruticose plants. Leaves in whorls of 3 to many. Flowers usually disposed in axillary or terminal cymes, occasionally simply axillary, or terminal, white, yellow, greenish, or purplish. — Gen. 24; Benth. & Hook. f. Gen. ii. 149; Gray, Syn. Fl. N. A. i. pt. 2, 35 (excl. § *Relbunium* in part); Schumann in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 4, 149. For generic synonyms, which relate chiefly to the Old World, see Hooker f. & Jackson, Index Kewensis, i. pt. 2, 991.

§ 1. Fruit uncinatè-hispid, or granular-papillose.

* Leaves in whorls of six or eight (rarely of ten or more); the angles of the stem as well as the midrib and margins of the leaves usually retrorsely aculeolate-hispid, less frequently smoothish, or rarely (in *G. triflorum*) somewhat hirsute.

+ Stems smoothish, or rarely somewhat hirsute-pubescent.

G. TRIFLORUM, Michx. Herbaceous: stems more or less pubescent: leaves elliptic-lanceolate to narrowly oblong-lanceolate, cuspidate-acuminate, 1.5 to 4 or rarely 8 cm. long, 5 to 10 or rarely 15 mm. broad, usually covered on the upper surface near the margin with subappressed hispidulous hairs, often slightly hispid on the midrib, otherwise glabrous: inflorescence cymose, terminal, usually 3-flowered. — Fl. i. 80; Willd. Hort. Berol. t. 66; DC. Prodr. iv. 601; Torr. & Gray, Fl. ii. 23;

Gray, Syn. Fl. N. A. i. pt. 2, 39; Wiegand, Bull. Torr. Club, xxiv. 403. — Common in moist shady places; Southern Greenland and Alaska to the Gulf of Mexico.

This species is doubtfully attributed to Mexico by Hemsley, Biol. Cent.-Am. Bot. ii. 66, but no Mexican specimens have been seen by the writer.

+ + Angles of the stem as well as the margins and midrib of the leaves retrorsely aculeolate-hispid.

+ + Fruit granular-papillose.

1. *G. asperrimum*, GRAY. Stems ascending, 3 to 6 dm. high, diffusely branched: leaves usually in whorls of six, oblanceolate, 1 to 2 cm. long, 3 to 6 mm. broad, glabrous except on the margins and midvein beneath: inflorescence cymose-paniculate, cymes dichotomously or trichotomously branching: flowers whitish: fruit about 2 mm. in diameter. — Pl. Fendl. 60, in Brew. & Wats. Bot. Calif. i. 284, & Syn. Fl. N. A. i. pt. 2, 39; Wats. Bot. King Exp. 134; Rothrock in Wheeler, Rep. vi. 138. — New Mexico, *Fendler*, no. 289; Sonora, *Wright*, no. 114; Chihuahua, hills west of the city of Chihuahua, *Pringle*, no. 558; also by the same collector on cool talus of cliffs, on neighboring mountains, no. 740; southwestern Chihuahua, August to November, 1885, *Palmer*, no. 414.

+ + Fruit more or less distinctly uncinat-hispid.

2. *G. aparine*, L. Stems 2 to 10 dm. or more long, somewhat reclining; nodes 2 to 10 cm. distant: leaves oblanceolate or oblanceolate-linear, 1 to 4 cm. long, 2 to 6 mm. broad, cuspidate-acuminate, usually hirsute-pubescent on the upper surface: flowers 1 to 3 in the upper axils, or terminating the lateral branches in 2-3-flowered cymes; corolla small, whitish: fruit 2 to 5 mm. in breadth. — Spec. i. 108; Reichenb. Ic. Fl. Germ. xvii. t. 1197; Gray, Syn. Fl. N. A. i. pt. 2, 36. — Sonora, *Thurber*, no. 437; Lower California, Guadalupe Island, *Palmer*, nos. 35, 850, All Saints' Bay, April, 1882, *Miss F. E. Fish*. — To the var. *Vaillantii*, Koch, Fl. Germ. ed. 1, 330 (Vaill. Par. t. 4, f. 4), some of the specimens above cited may be equally well referred. The variety differs only in being more slender, but as direct transitions occur no satisfactory distinctions can be drawn separating the variety from the species.

3. *G. mexicanum*, HBK. Stems ascending, much branched, strongly aculeolate-hispid on the angles, hirsute-pubescent at the nodes: leaves usually in sixes or eights, sometimes in whorls of ten or more, 8 to 20 mm. long, 1 to 3 mm. broad, margin revolute, apex strongly cuspidate-acuminate, usually smooth and shining above, rarely somewhat

hirtellous: inflorescence cymose-paniculate: corolla white or purplish, campanulate; lobes revolute, externally pubescent: fruit covered with rather short uncinat-hispid bristles. — Nov. Gen. & Spec. iii. 337; Hemsl. Biol. Cent.-Am. Bot. ii. 65. — Guanajuato, *Dugès*; Valley of Mexico, *Pringle*, no. 6518; Jalisco, Rio Blanco, *Palmer* (collection of 1886), no. 753; Tepic, near Santa Teresa, *Rose*, no. 2151; Orizaba, *Seaton*, no. 127. A specimen from Culiacan, *Palmer* (collection of 1891), no. 2777, may be doubtfully referred here.

Var. glabratum. Nearly glabrous throughout, otherwise as in the typical form. — Collected by *E. W. Nelson* on the west slope of Mt. Zempoaltepec, Oaxaca, altitude 2370 to 2460 m., 5 to 13 July, 1894, no. 583.

Var. platyphyllum. Similar to the species proper, but with broader oblanceolate or oblong-spatulate leaves, 1 to 2 cm. long, 2 to 6 mm. wide, abruptly cuspidate-acuminate at the rounded summit, not unfrequently hirtellous-puberulent beneath and occasionally hirsutish above. — Chiapas, near Christobal, altitude 2150 to 2704 m., 18 September, 1895, *E. W. Nelson*, nos. 3165, 3200; Oaxaca, Sierra de San Felipe, altitude 3075 m., 28 June, 1894, *Pringle*, no. 5663; vicinity of Yolontepec, altitude 1700 to 2150, 15 to 20 July, 1894, *Nelson*, no. 714; Colima, 9 January to 6 February, 1891, *Palmer*, no. 1407.

* * Leaves in whorls of four: the angles of the stem aculeolate-hispidulous: flowers cymose.

4. *G. prætermisum*, GREENM. Stems slender, 3 to 4 dm. long, ascending from a perennial base, slightly hispidulous: leaves linear-lanceolate to linear, 8 to 14 mm. long, 1 to 3 mm. broad, acute, margins revolute, upper surface often slightly hispidulous, the lower glabrous: flowers terminating the lateral branches in subtrichotomous cymes. — Proc. Am. Acad. xxxii. 306. — Federal District, *Pringle*, no. 6596.

* * * Leaves in fours: hirsute-pubescent to nearly glabrous plants, not retrorsely aculeolate-hispid: flowers terminating the stems and branches in rather close, or dichotomously branching cymes.

← Flowers paniculately disposed in dichotomously branching leafy cymes: uncinat bristles of the fruit subappressed.

5. *G. Pringlei*. Stems 3 to 5 dm. high, erect or ascending from a perennial base, covered with a spreading hirsute pubescence: leaves in fours, the uppermost opposite, 1-nerved, oblong-elliptic to oblong-lanceolate, 4 to 12 mm. long, 1 to 5 mm. broad, submucronate, narrowed at the base, hirsute-pubescent upon either surface: flowers sessile or short-pedicelled: corolla whitish: fruit about 1.5 mm. in breadth, covered with

subappressed uncinat hairs. — Collected by *C. G. Pringle* on shaded ledges of the Sierra Madre near Monterey, State of Nuevo Leon, 9 July, 1898, no. 1884, distributed as "*Galium uncinulatum*, DC.?"

+ + Flowers in terminal or lateral few-several-flowered loose cymes: uncinat bristles of the fruit spreading.

6. *G. orizabense*, HEMSL. An herbaceous perennial: stems 3 to 10 dm. or more long, erect or ascending, hirtellous-pubescent especially on the angles with short recurved hairs: leaves obscurely 3-nerved, linear-lanceolate or linear-oblong, 0.5 to 2 cm. long, 1.5 to 5 mm. wide, obtuse, a little narrowed at the base, usually hirtellous-pubescent upon either surface, and especially on the midrib beneath. — *Diag. Pl. Nov. pars tertia*, 54, & *Biol. Cent.-Am. Bot.* ii. 65. — Region of Orizaba, *Sumichrast*, nos. 838, 1933; *Müller*, nos. 1144, 1326; *Botteri*, no. 538.

7. *G. uncinulatum*, DC. Stems slender, usually several from a perennial base, nearly glabrous or pubescent with spreading or somewhat reflexed hirsute hairs: leaves 3-nerved from the subpetiolate base, oblong to oblong-lanceolate, mucronate, more or less hirsute upon either surface, especially on the veins beneath, sometimes nearly glabrous: inflorescence terminating the lateral branches in three-few-flowered cymes. — *Prodr.* iv. 600; *Hemsl. Biol. Cent.-Am. Bot.* ii. 66; *Wats. Proc. Am. Acad.* xviii. 99. *G. Jalapense*, Schlecht. *Linnæa*, ix. 591. — Sonora, *F. E. Lloyd*, no. 393; Nuevo Leon, Guajuco, *Palmer*, March, 1880, no. 412; San Luis Potosi, *Schaffner*, no. 840 (a nearly smooth form); Valley of Mexico, *Schaffner*, no. 179, *Pringle*, no. 6462; Orizaba, *Botteri*, nos. 188, 945, 1174, *Müller*, no. 1820, *Seaton*, no. 209, *Sumichrast*, no. 1921; Oaxaca, vicinity of Cerro San Felipe, *Nelson*, no. 1103. Specimens collected by *Pringle*, San Luis Potosi, no. 5125, and Puebla, no. 7018, seem to connect with the following variety.

Var. *obstipum*, Wats. Leaves usually smaller, suborbicular to oblanceolate, densely hirsute-pubescent beneath. — *Proc. Am. Acad.* xviii. 99. *G. obstipum*, and varieties, Schlecht. *Linnæa*, ix. 592; *Hemsl. Biol. Cent.-Am. Bot.* ii. 65. — Coahuila, Lerios, about 70 km. east of Saltillo, July, 1880, *Palmer*, no. 413, by the same collector in the Caracol Mts., 33 km. east of Monclova, August, 1880, no. 414; Michoacan, Patzcuaro hills, 8 November, 1890, *Pringle*, no. 3597; Real del Monte, *Th. Coulter*, no. 185; Chiapas, *Ghiesbreght*, no. 886; Guatemala, Coban, Depart. Alta Verapaz, altitude 1325 m., *von Tuerckheim* (Donnell Smith's sets, no. 1222).

Var. (?) *nanum*. Low, about 1 dm. high: stems glabrous or slightly pubescent at the nodes: leaves oblanceolate, 5 to 10 mm. long,

2 to 3.5 mm. broad, submucronate, narrowed into a subpetiolate base, glabrous or somewhat hirtellous on the upper surface and on the margin, rather densely elongate-punctate: flowers terminating the lateral branches usually in 3-flowered cymes. — Collected about Orizaba by Müller in 1885, no. 1523.

+ + + Flowers terminating the stems and branches in small close cymes: uncinat bristles of the fruit spreading.

++ Essentially glabrous: flowers usually white or greenish white.

8. *G. Seatonii*. Perennial: stems prostrate or ascending, much branched, glabrous: leaves sessile, broadly oblong to oblong-lanceolate, 3 to 10 mm. long, 1.5 to 5 mm. broad, submucronate or short-acuminate, glabrous or slightly hirtellous on the upper surface: corolla about 3 mm. broad, 4-lobed; lobes oblong-ovate, acute: pedicels later becoming somewhat elongated, 3 to 8 mm. in length: fruit 1.5 mm. in breadth. — Mt. Orizaba, altitude 3075 m., 5 August, 1891, *Henry E. Seaton*, no. 174, distributed as *G. uropetalum*, Hemsl.; Federal District, Serrania de Ajusco, altitude 3075 m., 6 September, 1896, *Pringle*, no. 6461, distributed as *G. Jalapense*, Schlecht.

++ Hirsute-pubescent: flowers purplish.

9. *G. Nelsonii*. Perennial: stems ascending, 1 to 2 dm. in length, more or less branched, hirsute-pubescent upon the angles and also at the nodes: leaves sessile, ovate or slightly oblong-ovate, acute, usually hirsute-pubescent above and on the midrib beneath, margin ciliate: flowers, bracts, and upper leaves purplish: corolla about 3 mm. in diameter, 4-parted; lobes oblong-ovate, obtusish. — Summit of Mt. Zempoaltepec, Oaxaca, altitude 3480 m., 9 July, 1894, *E. W. Nelson*, no. 628.

* * * * Leaves in fours: inflorescence chiefly axillary.

+ Flowers on slender pedicels.

G. TEXENSE, Gray. Annual, branching from the base: stems more or less erect, 1 to 3 or 4 dm. high, hirsute-pubescent: leaves ovate or oblong-ovate, 0.5 to 1.5 cm. long, one half to two thirds as broad, hirsute-pubescent upon either surface: peduncles axillary, slender, about equaling the leaves, occasionally proliferous: fruit 2 mm. in diameter. — Proc. Am. Acad. xix. 80, & Syn. Fl. N. A. i. pt. 2, 36. *G. Californicum*, var. *Texanum*, Torr. & Gray, Fl. ii. 20. *G. uncinulatum*, Gray, Pl. Lindh. ii. 215? not DC. — Texas, *Drummond*, no. 115, *Lindheimer*, no. 619, *Wright* (without number), on rocky hills near Austin, *E. Hall*, no. 274, along Brazos River, Palo Pinto Co., *Reverchon*. No specimens from Mexico, belonging to this species, have been seen by the writer, yet it is altogether probable that the species occurs south of the Rio Grande.

G. CANESCENS, HBK. Stems procumbent, nearly glabrous below, spreading-villous above: leaves ovate, 8 to 10 mm. long, 4 to 5 mm. broad, short-acuminate, 3-nerved, membranous, spreading-villous upon either surface, and upon the midrib beneath, ciliate, later somewhat glabrate: flowers axillary, solitary or terminating the branches in threes: corolla glabrous; lobes ovate, subacuminate. — Nov. Gen. & Spec. iii. 336. No Mexican specimens of this species have been seen by the author. Ghiesbreght's no. 886 from Chiapas, referred by Hemsley, Biol. Cent.-Am. Bot. ii. 64, to the above species, is best referred, as pointed out by Dr. Watson, Proc. Am. Acad. xviii. 99, to *G. uncinulatum*, DC., var. *obstipum*. The above description is drawn from Jameson's specimen collected in the Andes of Ecuador in 1859, which corresponds well with the original description.

— — Flowers sessile.

11. *G. proliferum*, GRAY. Annual, simple or branching from the base: stems ascending or erect, 1 to 4 dm. high, shortly hirsute-pubescent, or nearly glabrous: leaves ovate or oblong-ovate, the lowermost often broadly ovoid and subpetiolate, obtuse, spreading-hirsute upon either surface, often nearly or even quite glabrous: flowers sessile, terminating the rather short lateral subhorizontally spreading branches, the lateral branches often proliferous, bearing a second or even a third flower: corolla white, small: fruit about 3 mm. in breadth on extremely short recurved pedicels, subtended by two or four upturned leaf-like bracts. — Pl. Wright. ii. 67, & Syn. Fl. N. A. i. pt. 2, 37. *G. virgatum*, var. *diffusum*, Gray, Pl. Wright. i. 80. — New Mexico, *Wright*, nos. 1112 (type), 281; Texas, El Paso, *Dr. Dieffendorfer*, also collected in the same locality by *Vasey* in 1881; Arizona, hills near Tucson, 28 April, 1883, *Pringle*, no. 15, on the foothills of the Santa Rita Mountains, 13 May, 1884, *Pringle*, in part; Nuevo Leon, Guajuco, about 40 km. south-east of Monterey, March, 1880, *Palmer*, no. 411.

Var. *subnudum*. Stem and leaves glabrous: fruit only slightly hirtellous. — Foothills of the Santa Rita Mountains, Arizona, 13 May, 1884, *Pringle*, in part.

G. VIRGATUM, Nutt. Stems simple or branched from the base; branches spreading or erect, 1 to 3 dm. high, somewhat virgate, hirsute-pubescent upon the slightly thickened angles, occasionally nearly glabrous: leaves oblong-linear to oblong-lanceolate, 1 cm. or less in length, 1 to 3 mm. broad, obtusish, usually hirsutish above and on the midrib beneath, ciliate, sometimes nearly glabrous: flowers terminating the extremely short lateral branches or peduncles, appearing axillary, sub-

tended by two leaf-like bracts, the lateral branches or peduncles not proliferous, reflexed in fruit. — Torr. & Gray, Fl. ii. 20; Gray, Pl. Lindh. ii. 215, & Syn. Fl. N. A. i. pt. 2, 36. *G. Texanum*, Scheele, Linnæa, xxi. 597. — Louisiana, *Hale*; Texas, *Lindheimer*, nos. 246, 491, *Drummond*, no. 111, *Wright* (without number), at Belknap, *Sutton Hayes*, no. 327 in part, Dallas, May, 1875, *Reverchon*, *Heller*, no. 1437 (distributed as *G. Texense*, A. Gray); Missouri, Allenton, 15 June, 1880, *Geo. W. Letterman*; Tennessee, cedar barrens at La Vergne, 16 May, 1882, *Gattinger*.

VAR. LEOCARPUM, Torr. & Gray. Stem and leaves nearly glabrous: fruit smooth and glabrous. — Torr. & Gray, Fl. ii. 20; Gray, Syn. Fl. N. A. i. pt. 2, 36. — Texas, *Drummond*, no. 113, *E. Hall*, no. 273, *Wright* (without number), also a specimen of Nuttall's collection bearing the datum "Red River."

§ 2. Fruit hirsute with long and straight (not uncinat-tipped) bristles.

* Leaves linear or linear-oblong (in *G. Wrightii*, var. *latifolium*, often somewhat elliptic or oblong-ob lanceolate), 1-nerved.

+ Flowers axillary, solitary or in pairs, subsessile.

12. *G. oresbium*. Perennial: stems from a woody base, somewhat cespitose, 1 to 2 dm. high, below often naked and glabrate, numerously branched, leafy and pilose-hirsute above: leaves in fours, linear or linear-oblong, 2 to 4 mm. long, 1 mm. or less in breadth, acutish, hirsute-pubescent, margin revolute, midrib much thickened and prominent beneath, bearing on the under surface near the apex a single large gland: corolla about 2.5 mm. in diameter, 4-parted; lobes oblong-ovate, obtuse, externally pubescent. — Collected by *C. G. Pringle*, on dry mountain walls, Sierra de la Silla, Nuevo Leon, 16 July, 1889, no. 2542.

+ + Inflorescence cymose-paniculate: flowers distinctly pedicellate.

+ + Dioecious: flowers yellowish.

G. FENDLERI, Gray. Stems several, erect or ascending, 1.5 to 3 dm. high, rising from a perennial base, glabrous or minutely and closely puberulent: leaves linear or linear-oblong, 0.5 to 1.5 cm. long, 1 to 3 mm. broad, acute or obtuse, glabrous or finely puberulent: flowers small: ovary bearing inconspicuous closely appressed hairs, these later spreading and becoming more prominent. — Pl. Fendl. 60, & Syn. Fl. N. A. i. pt. 2, 41. *G. Rothrockii*, Gray, Proc. Am. Acad. xvii. 203, in part (as to Rusby's plant). — New Mexico, *Fendler*, no. 288, White Mts., altitude 2300 m., *Wootton*, no. 287; Arizona, Mogollon Mts., *Rusby*, no. 155, Santa Rita Mts., 10 July, 1881, and 25 July, 1884, *Pringle*, Mt. Graham, *Rothrock*, no. 416, near Fort Huachuca, *Lemmon*, no. 2903.

++ ++ Flowers perfect or polygamo-monœcious, purplish.

13. *G. Rothrockii*, GRAY. Stems several from a woody base, profusely branched, hirtellous-pubescent below and on the young shoots, glabrous above, rarely glabrous throughout: leaves linear, 0.5 to 1.5 cm. long, rather rigid, acute or short-acuminate, subpungent-tipped, glabrous or somewhat hirtellous: lobes of corolla acuminate: fruit rather sparingly hirsute. — Proc. Am. Acad. xvii. 203 (excluding Rusby's plant), & Syn. Fl. N. A. i. pt. 2, 39. — Arizona, *Rothrock*, no. 675, *Lemmon*, nos. 526, 3010, 2718; Lower California, *Orcutt*, no. 912; Sonora, *Wright*, no. 1113 in part; Chihuahua, *Pringle*, no. 661.

14. *G. Wrightii*, GRAY. Hirsute-pubescent throughout: stems about 3 dm. high, rising from a woody base, profusely branched above: leaves linear to linear-oblong, 0.5 to 1.5 cm. long, 1 to 3 mm. broad, obtusish to mucronate-acuminate: corolla brownish purple; lobes mucronate-acuminate: fruit more densely hirsute than in the preceding species. — Pl. Wright. i. 80, ii. 67 in part, & Syn. Fl. N. A. i. pt. 2, 39. — Arizona, Apache Pass, *Lemmon*, no. 615, near Fort Huachuca, nos. 2902, 3011–2; New Mexico, *Wright*, nos. 421, 235 (type); Sonora, *Wright*, no. 1113 in part.

Var. *latifolium*, ROB. & FERN. Much less pubescent than in the species proper: leaves linear-oblong to elliptic-oblong, slightly narrowed toward the base, 0.5 to 1.5 cm. long, 1 to 5 mm. broad. — Proc. Am. Acad. xxx. 116. — Sonora, *Hartman*, no. 58.

* * Leaves linear-lanceolate to ovate-acuminate, lateral nerves absent.

15. *G. stellatum*, KELLOGG. Suffrutescent, 2 to 6 dm. high: stems covered with a light gray or yellowish bark; branchlets hirtellous or hispidulous: leaves rather rigid, 0.5 to 1.5 cm. long, 1 to 5 mm. broad, usually attenuate-acuminate, sometimes ovate, merely acute: flowers white: fruit densely pilose-hirsute; hairs in length exceeding the diameter of the fruit. — Proc. Cal. Acad. ii. 97, f. 26; Gray, Syn. Fl. N. A. i. pt. 2, 40. *G. acutissimum*, Gray, Proc. Am. Acad. vii. 350, not of Eastwood, Proc. Cal. Acad. vi. 292 (1896). — "Between the Rio del Norte and New Mexico," *Dr. Newberry*; Southern Utah, Santa Clara, *Palmer*, no. 86; Arizona, Camp Grant, 27 April, 1867, *Palmer*, no. 105, rocky cañons of the Santa Catalina Mts., altitude 770 to 1085 m., 19 April, 1881, *Pringle*, Santa Cruz, *Parish*, no. 76, Wickenburg, *Palmer*, no. 616; Southern California, *Parish*, nos. 1724, 2381, Colorado Desert, San Diego Co., *Orcutt* (without number), Panamint Mountains, *Coville & Funston*, no. 715; Lower California, Los Angeles Bay, Gulf of California, November, 1887, *Palmer*, nos. 525, 525½, 526.

* * * Leaves elliptic to oblong-ovate, usually 3-nerved from the base, bearing a single large gland or cluster of glands on the lower surface at the tip.

+ Leaves distinctly 3-nerved, margins strongly revolute.

16. *G. hypadenium*, SCHAUER. Suffrutescent: stems prostrate or ascending, glabrescent, often leafless and little branched below, covered with a thin grayish bark which later separates from the stem, freely branching above; branches tetragonal, pilose-hirsute: leaves sessile, 4 to 10 mm. or more long, nearly one half as broad, obtuse, usually hirsute-pubescent, more or less glabrate above, rather densely white-pilose or merely hirsute beneath, margins ciliate: corolla 4-parted, about 2 mm. in diameter; lobes externally pubescent with rather long hairs: fruit about 2 mm. in breadth; carpels somewhat separated at maturity. — Linnæa, xx. 700. *G. leucotrichum*, Hemsley, Biol. Cent.-Am. Bot. ii. 65, & v. t. xli. figg. 4-6. — Orizaba, Müller, nos. 174, 1218, *Sumichrast*, no. 514; Puebla, dry limestone ledges near Tehuacan, altitude 1540 m., 27 August, 1897, *Pringle*, no. 6694; Guerrero, between Chilopa and Tixtla, altitude 1540 to 2150 m., 17 December, 1894, *E. W. Nelson*, no. 2166; Jalisco, near Guadalajara, *Pringle*, 5046.

17. *G. fuscum*, MART. & GAL. Perennial: stems tetragonal, becoming more or less scabrous along the slightly thickened angles, the younger stems and branches bearing scattered pilose-hirtellous slightly curved hairs: leaves elliptic-oblong, 0.5 to 1.5 cm. long, 2 to 8 mm. broad, short-petiolate, submucronate or merely acute, glabrous or sparingly hirsute above and upon the nerves beneath, conspicuously glandular-punctate; margins usually ciliate: inflorescence cymose-paniculate: flowers brownish purple; lobes of corolla commonly pubescent. — Bull. Acad. Brux. xi. i. 126; Walp. Rep. vi. 13; Hemsley, Biol. Cent.-Am. Bot. ii. 64. — Oaxaca, Cerro de San Felipe, *Galeotti*, no. 2633, dry hills near the City of Oaxaca, altitude 1845 m., *Pringle*, no. 4795 (distributed as *G. uncinulatum*, DC., var. *abstipum*, Watson), near Reyes, altitude 1750 to 2000 m., *E. W. Nelson*, no. 1774; Guanajuato, *Dugès*.

+ + Leaves indistinctly 3-nerved, margins little or not at all revolute.

18. *G. hystricocarpum*. Stems usually many from a perennial base, ascending, more or less branched above, covered with a spreading pilose-hirsute pubescence: leaves elliptic-oblong to oblong-lanceolate, 5 to 12 mm. long, 2 to 7 mm. broad, short-acuminate or submucronate, hirsute on the upper surface and upon the midrib and inconspicuous lateral nerves beneath: flowers white, somewhat cymose-paniculate or terminating the lateral branches in few-flowered cymes: lobes of the corolla covered externally with a few long pilose hairs. — Cool cliffs and

ledges on mountains near Chihuahua, 25 October, 1886, *Pringle*, no. 741, distributed as *G. uncinulatum*, DC., var. *obstipum*, Watson.

§ 3. Fruit smooth and glabrous, dry, subcarneous or distinctly baccate.

* Herbaceous, nearly or quite glabrous plants: leaves usually in fours, occasionally in fives, sixes, or in whorls of seven.

+ Leaves linear-oblong to spatulate-oblong, obtuse: fruit dry.

G. BRANDEGEEI, Gray. Low herbs: stems 0.5 to 1.5 dm. high, usually matted or caespitose-depressed, glabrous or minutely hispidulous on the angles: leaves 5 to 10 mm. long, 2 to 3 mm. broad, glabrous or slightly hispidulous on the margins and midrib beneath: flowers axillary, solitary or in pairs: pedicels in fruit usually less than 1 cm. in length. — Proc. Am. Acad. xii. 58, & Syn. Fl. N. A. i. pt. 2, 38. *G. Brandegeei*, Wiegand, Bull. Torr. Bot. Club, xxiv. 398. — New Mexico, Valley of the Rio Grande, *Brandegee* (type); extending northward, according to Wiegand, to Saskatchewan. No Mexican specimens of this species have been seen by the writer, although the plant very probably occurs along the northern boundary.

19. *G. trifidum*, L., var. *subbiflorum*, WIEGAND. Stems weak, ascending, usually much branched, nearly glabrous: leaves 5 to 15 mm. long, about 2 mm. broad, obtuse or slightly rounded at the apex, slightly hispidulous on the margins. — Bull. Torr. Bot. Club, xxiv. 399. — Federal District, Valley of Mexico, *Pringle*, nos. 6785, 7208.

Very difficult of separation, and perhaps not distinct from *G. Claytoni*, Michx.

+ + Leaves (nearly 4 cm. in length) oblong or obovate, cuspidate or aristate: fruit subcarneous.

20. *G. glaberrimum*, HEMSL. Glabrous throughout, glaucous; branches striate: leaves in whorls of seven (or the uppermost opposite), sessile, membranous, cuneate: flowers minute, disposed in a loose cyme; pedicels slender: fruit naked, somewhat fleshy. — Diag. Pl. Nov. pars tertia, p. 53, & Biol. Cent.-Am. Bot. ii. 64. — Mexico, *Liebmann*, no. 220.

+ + + Leaves (1.5 cm. or less in length) linear-oblong to elliptic-oblong, cuspidate-acuminate: fruit subcarneous or distinctly baccate.

+ + Inflorescence terminating the stems and branches in few-flowered cymes: fruit subcarneous.

21. *G. Galeottianum*, WALP. Perennial nearly glabrous throughout, slightly hispid on the stems below: stems slender, reclining or ascending, 3 to 15 dm. long: leaves in fours, linear-oblong to oblong-

ovate, 5 to 10 mm. long, 1 to 4 mm. broad, acuminate, glabrous or slightly hispidulous on the margins, elongate-glandular-punctate beneath, and with a cluster of glands below near the tip: flowers brownish purple; lobes of the corolla cuspidate-attenuate. — Rep. vi. 17. *G. uropetalum*, Hemsley, Biol. Cent.-Am. Bot. ii. 66, & v. t. xli. f. 7-9. *Rubia acuminata*, Mart. & Gal. Bull. Acad. Brux. xi. 1, 127. — Southern Mexico, *Galeotti*, nos. 2631, 2632; Oaxaca, Sierra de San Felipe, altitude 3072 m., *Pringle*, no. 4710, vicinity of La Parada, altitude 2300 to 2700 m., *E. W. Nelson*, no. 1015.

++ ++ Flowers axillary or mostly terminating the branches in pairs: fruit distinctly baccate.

22. *G. Aschenbornii*, SCHAUER. Perennial, many stemmed from the base: stems reclining or ascending, 3 to 5 dm. or more in length, glabrous or minutely hispidulous: leaves in fours, linear-oblong to elliptic-oblong, occasionally somewhat oblong-lanceolate, 0.5 to 1.5 cm. long, 2 to 5 mm. broad, acute, or cuspidate-acuminate, oblong-punctate beneath with a large gland or cluster of glands on the lower surface near the apex, glabrous or hispidulous on the margins: flowers at least in the dried state a greenish yellow; lobes of corolla cuspidate-acuminate: pedicels glabrous, in fruit 2 to 6 mm. in length: mature fruit about 5 mm. in breadth. — Linnæa, xx. 701. *G. geminiflorum*, Mart. & Gal. Bull. Acad. Brux. xi. 1, 126; Walp. Rep. vi. 17; Hemsley, Biol. Cent.-Am. Bot. ii. 64, & v. t. xli. f. 1-3. — Valley of San Luis Potosi, *Schaffner*, no. 841; Zimapan, *Th. Coulter*, no. 189; Jalisco, volcano of Colima, *Marcus E. Jones*, no. 218; Federal District, under pines, base of Sierra de Ajusco, altitude 2460 m., *Pringle*, no. 6597; Orizaba, *Müller*, no. 1444, *Galeotti*, no. 2604, and according to Hemsley, *Liebmänn*, no. 236; Guatemala, *Donnell Smith*, no 1970, *Heyde & Lux*, no. 3975 (of Donnell Smith's sets), the latter distributed as *Relbunium hypocarpium*, Hemsl., and according to Hemsley, Biol. Cent.-Am. Bot. l. c., *Bernoulli*, no. 292.

* * More or less suffruticose plants, hirsute-pubescent throughout: leaves in whorls of four to seven.

+ Stems 5-7-angled.

23. *G. angulosum*, GRAY. Fruticose: stems 5-7-angled, covered below with a grayish bark; branches divaricately spreading, hirsute-pubescent especially on the angles: leaves in whorls of four to seven, linear-oblong or somewhat elliptic-oblong, 6 to 10 mm. long, 2 to 4 mm. broad, acute, slightly cuspidate-acuminate, hirsute-pubescent on the

upper surface and on the prominent midrib beneath, margins ciliate: flowers axillary or terminating the stems and short lateral branchlets: corolla glabrous, greenish white; lobes broadly oblong-ovate, acute: pedicels of the young fruit nearly 2 mm. in length, somewhat thickened, glabrous or sparingly hirsute: immature fruit glabrous, seemingly baccate. — Proc. Am. Acad. xi. 74, 115. — Guadalupe Island, off Lower California, *Palmer*, no. 36.

+ + Stems 4-angled.

24. *G. pubens*, GRAY. A stout herbaceous perennial: stems apparently becoming somewhat indurated at the base: leaves in fours or rarely in fives, broadly ovate, ovate-oblong or oblong-linear, 5 to 15 mm. long, 2 to 8 mm. broad, acute or shortly subacuminate, hirsute-pubescent on either surface, the scattered hairs of the upper surface often curved or subuncinate, margins slightly hispid: flowers axillary or cymose: pedicels recurved, pubescent: immature fruit minutely pubescent, distinctly baccate: male plants more profusely flowered. — Proc. Am. Acad. vii. 350, Bot. Cal. i. 285, & Syn. Fl. N. A. i. pt. 2, 40. — California, *Bolander*, no. 6346, *Torrey*, no. 188; Lower California, near Encenada, 12 April, 1882, *Marcus E. Jones*, also from Lower California, collected by *Orcutt* in 1883, without number.

§ 4. Species of doubtful affinity.

25. *G. ? denticulatum*, BARTL. Stems diffusely branching, hispidulous-setose: leaves in fours, ovate, cuspidate, remotely dentate-ciliate, subhirsute upon either surface, 1-nerved: flowers few, terminating the stems, usually in threes: pedicels capillary: fruit glabrous? — In DC. Prod. iv. 612; Hemsley, Biol. Cent.-Am. Bot. ii. 64. — Mexico, Real del Monte, *Hænke*. Specimens not seen. Description compiled from De Candolle's Prodrômus.

RELBUNIMUM, Endl. (Name a Latinization of *relbun*, which Feuillée states to be the vernacular for a Chilian dye plant, the *Relbunium hypocarpium* of Hemsl.) — Flowers perfect, subtended by a 2-4-bracteate involucre. Calyx-tube globose; limb obsolete. Corolla rotate, 4-lobed; lobes valvate. Stamens 4, exserted, adnate to the tube of the corolla; filaments short; anthers ditheous. Ovary 2-celled; styles 2, free or connate at the base; stigmas capitate; ovules solitary in the cells, borne on the dissepiment, amphitropous. Fruit didymous, more or less fleshy or baccate, smooth and glabrous, or hirsute, usually two- or by absorption one-seeded. Seeds concave on the face: embryo curved; cotyledons foliaceous; radicle inferior. — Herbaceous perennials having

the habit, flowers, and foliage of *Galium*, but with the leaves in whorls of four, axillary inflorescence, involucre flowers, and usually fleshy fruit. — Gen. Pl. 523 (as a section under *Galium*); Benth. & Hook. f. Gen. ii. 149; Schumann in Fl. Bras. vi. pt. 6, 103; Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 4, 154. *Galium* § *Relbunium*, Gray, Syn. Fl. N. A. i. pt. 2, 40, in part.

§ 1. Involucre of two bracts: fruit pedicellate.

1. *R. sphagnophilum*. A slender delicate annual, pale green, glabrous throughout: stems reclining, rooting at the nodes; internodes 2 to 12 mm. in length: leaves ovate-elliptic, 2 mm. long, one half to two thirds as broad, acute, narrowed below into a subpetiolate base: peduncles axillary, solitary, 2-bracteate above; bracts minute, less than 1 mm. in length: corolla not seen: fruit baccate, glabrous, about 1 mm. in breadth. — Collected by C. G. Pringle in sphagnum on the Sierra de Clavellinas, Oaxaca, altitude 2770 m., 17 October, 1894, no. 5812. Probably a near relative of the South American *R. humile*, Schumann.

§ 2. Involucre of four bracts: fruit sessile or nearly so.

* Leaves elliptic to obovate: plant hirsute-pubescent.

2. *R. hypocarpium*, HEMSL. Annual: stems 1 to 10 dm. long, pilose: leaves membranous, 5 to 15 mm. long, 3 to 8 mm. broad, rounded and usually obtusely mucronate at the apex, entire, ciliate, slightly narrowed at the base, pubescent upon either surface, dark green above, paler beneath: peduncles 5 to 15 mm. long: bracts of the foliaceous involucre ovate, acute or obtusish, narrowed into a subpetiolate base: flowers sessile; lobes of the corolla ovate, acutish, ciliate: fruit black or reddish, hirsute. — Biol. Cent.-Am. Bot. ii. 63. *R. hypocarpum*, Schum. Fl. Bras. vi. pt. 6, 112, t. 92. *Rubia hypocarpia*, DC. Prodr. iv. 591; *Valantia hypocarpia*, L. Syst. Nat. ed. 10, 1307. *V. hypocarpa*, L. Spec. ed. 2, ii. 1491. — Jalapa, C. L. Smith, no. 1570; Mirador, Liebmann, no. 225; Orizaba, Müller, nos. 1551, 1699, *Sumichrast*, no. 468; Oaxaca, Pringle, no. 5629; Guatemala, von Türckheim (no. 721 of Donnell Smith's sets).

* * Leaves ovate-oblong to oblong-lanceolate: plant glabrous.

3. *R. lævigatum*, HEMSL. Stems cespitose, diffusely branched: leaves ovate-oblong or ovate-lanceolate: peduncles axillary: flowers sessile and solitary in the involucre: fruit glabrous. — Biol. Cent.-Am. Bot. ii. 63. *Rubia lævigata*, DC. Prodr. iv. 591 (whence above description). *Galium lævigatum*, Bartl. in DC. Prodr. iv. 591. — Collected in Mexico by Hænke. Specimens not seen.

* * * Leaves lanceolate to lance-oblong, pubescent or at least ciliated; margins not conspicuously thickened.

4. *R. hirsutum*, SCHUMANN. Low prostrate many-stemmed herbaceous perennial; stems 4-angled, covered upon the somewhat thickened angles by a spreading hirsute pubescence: leaves lance-oblong, a centimeter or less in length, 2.5 to 3 mm. broad, hirsute-pubescent upon the upper surface and upon the midrib beneath, ciliate: the 1-flowered involucre solitary in the axils; their peduncles about equalling the leaves. — Fl. Bras. vi. pt. 6, 116. *Galium hirsutum*, Ruiz & Pavon, Fl. Peruv. i. 59.

The above description has been drawn from South American material, which well accords with the original characterization of the species by Ruiz and Pavon. No Mexican specimens have been seen by the writer. To this species, however, Martens and Galeotti in Bull. Acad. Brux. xi. pt. 1, 126, doubtfully refer *Galeotti's* no. 2650, collected on rocks near Mirador, Vera Cruz.

5. *R. ciliatum*, HEMSL. Low herbaceous plants: stems obtusely 4-angled, glabrous, leaves narrowly lanceolate, 1 cm. or less in length, acute, glabrous upon either surface, margin ciliate: peduncles axillary, solitary, slender, 3 to 5 mm. long; bracts of the involucre somewhat unequal, narrowly lanceolate, acute, ciliate: flowers sessile: fruit glabrous. — Biol. Cent.-Am. Bot. ii. 62. *Galium ciliatum*, Ruiz & Pav. Fl. Peruv. i. 59. *G. involucratum*, HBK. Nov. Gen. & Spec. iii. 335. *Rubia ciliata*, DC. iv. 591. — South Mexico in woods of El Sabino near the city of Mexico, *Galeotti*, no. 2596, acc. to Martens & Galeotti, Bull. Acad. Brux. xi. pt. 1, 126.

The typical plant is a native of Western South America. No Mexican or Central American specimens belonging to this species have been seen by the writer.

* * * * Leaves lance-linear to linear, more rigid; margins conspicuously thickened.

6. *R. microphyllum*, HEMSL. Glabrous throughout: stems rising from a perennial base, erect or nearly so, 1 to 3 dm. high, much branched above; branches obtusely 4-angled, faces somewhat furrowed: leaves 5 to 15 mm. long, usually pungent-tipped; margins revolute, thickened, smooth: peduncles axillary, solitary: bracts of the involucre similar to the leaves but smaller: flowers sessile; corolla-lobes ovate, obtusish: fruit glabrous or rarely slightly granulose, sessile or short-pedicellate. — Biol. Cent.-Am. Bot. ii. 63. *Galium microphyllum*, Gray, Pl. Wright. i. 80 & Syn. Fl. N. A. i. pt. 2, 41. — New Mexico, *Wright*, nos. 234,

420, 1111, Pinos Altos Mts., *Greene*, no. 145; Arizona, ravines about Camp Grant, 23 April, 1867, *Palmer*, no. 106, banks south of Camp Apache, *Rothrock*, no. 271, Santa Catalina Mts., and at Ft. Bowie, *Lemmon*, no. 127, also on Santa Catalina Mts., altitude 770 to 925 m., 17 April, 1881, *Pringle*, *Lemmon*, no. 527; Texas, El Paso, *Thurber*, nos. 179, 1118, at Belknap, *Sutton Hayes*, no. 327; N. W. Mexico, *Seemann* (without number); Sonora, about Hermosillo, *Crawford*, 1888; S. W. Chihuahua, August to November, 1885, *Palmer*, no. 413; Coahuila, Mts., 14.5 km. east of Saltillo, July, 1880, *Palmer* (without number); region of San Luis Potosi, *Schaffner*, no. 842 a, and at Soledad, 40 km. southwest of Monclova, September, 1880, *Palmer*, no. 415; Morelos, at Tres Marias near Cuernavaca, altitude 2920 m., *Pringle*, no. 7233. A species on the one hand, through var. *setulosum*, approaching the South American *R. ciliatum*, Hemsl., and on the other, through the var. *hispidulum*, the Mexican *R. polyplocum*, Hemsl.

Var. setulosum. Leaves setulose-ciliate: fruit granulose-hispid, otherwise like the species. — *R. microphyllum*, Hemsl. Biol. Cent.-Am. Bot. ii. 63, in part. — Zimapan, *Th. Coulter*, no. 186; region of San Luis Potosi, *Parry & Palmer*, nos. 309, 310.

Var. hispidulum. Habit of the species proper: stem and leaves covered with a scattered short hispidulous pubescence: fruit essentially glabrous, or somewhat granulose. — *R. polyplocum*, Hemsl. Biol. Cent.-Am. Bot. ii. 63, in part. — Valley of San Luis Potosi, *Schaffner*, no. 842; region of San Luis Potosi, altitude 1850 to 2460 m., *Parry & Palmer*, no. 308. Approaching the following species in the character of the pubescence, but having a distinctly different habit.

7. *R. polyplocum*, HEMSL. Herbaceous, closely hispidulous-pilose throughout: stems much branched forming dense mats; branches very slender, obtusely tetragonal as in the preceding species: leaves acute or obtusish, not distinctly cuspidate-tipped: flowers solitary, sessile in the small involucre bracts: fruit sessile or nearly so, small, white-granulose or glabrous. — Biol. Cent.-Am. Bot. ii. 63. — Southern Mexico, Mirador, *Liebmann*, no. 244, and (according to Hemsley) no. 243; also *Linden*, no. 516.

***R. ASCHENBORNII*, Hemsl. Biol. Cent.-Am. Bot. ii. 62, is *Galium Aschenbornii*, Schauer, treated above.**